

# **Proposal Reviews**

## **#240: Mercury and Methylmercury Loads to the Yolo Bypass and Delta / Transformations of Mercury and Methylmercury Within the Yolo Bypass**

US Geological Survey

**Research and Restoration Technical Panel Review**

**Delta Regional Review**

**Sacramento Regional Review**

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**Prior Performance/Next Phase Funding**

**Environmental Compliance**

**Budget**

## Research and Restoration Technical Panel Review:

### CALFED Bay-Delta 2002 ERP PSP Research and Restoration Technical Panel Review Form

**Proposal Number:** 240

**Applicant Organization:** US Geological Survey

**Proposal Title:** Mercury and Methylmercury Loads to the Yolo Bypass and Delta / Transformations of Mercury and Methylmercury Within the Yolo Bypass

**Review:**

**Please provide an overall evaluation summary rating:**

**Superior:** outstanding in all respects;

**Above Average:** Quality proposal, medium or high regional value, and no significant administrative concerns;

**Adequate:** No serious deficiencies, no significant regional impediments, and no significant administrative concerns;

**Not Recommended:** Serious deficiencies, significant regional impediments or significant administrative concerns.

| Overall Evaluation Summary Rating | Provide a brief explanation of your summary rating   |
|-----------------------------------|--|
| -Superior                         | <b>The authors have presented a framework for a potentially interesting study on Hg dynamics of the Yolo Bypass, a temporarily-flooded agricultural area. The complexity of the system, its many hydrologic inputs and contrasting soil types were not adequately addressed in the simplified sampling plan. The PIs need to refine their approach and provide better hypotheses and a refined sampling protocol if they were to resubmit to CALFED.</b> |
| -Above average                    |  |
| -Adequate                         |  |
| XNot recommended                  |  |

1. **Goals and Justification.** Does the proposal present a clear statement of goals, objectives and hypotheses? Does the proposal present a clear justification and conceptual model for the project?

**The PIs propose to conduct a study of mercury cycling in a confined area of the Sacramento River Basin, the Yolo Bypass. They set up the reasons for studying the area and associated Hg problems, yet they really do not present a concise listing of the major goals, subgoals and hypotheses. The proposal certainly would have been an easier read with such a format, especially stated hypotheses. The topic of mercury cycling and flooding of soils is high on the radar screens of Hg researchers and one that is of great interest as management concerns contemplate options for wetland creation. This is both a research and monitoring project that combines new techniques for understanding Hg formation and degradation and utilizes the strengths of hydrologists to conduct the true balance.**

2. **Likelihood of Success (Approach, Feasibility, Capabilities and Performance Measures).** Is the project likely to succeed based on the approach, feasibility and project team capabilities? Are the proposed performance measures adequate for measuring the project's success?

The panel felt that the study design is far too simplistic to properly study this highly complicated system. The mass balance approach may be commendable, but the hydrologic complexity of numerous inflowing streams and drainage ditches makes that approach quite difficult. There is potential that displacement subsurface water and the associated MeHg built up over the agricultural growing season may be the greatest flux. It is therefore quite important for the methylation studies to occur during the perceived dry season, a time for either formation in or leaching to, groundwater. Perhaps some piezometer/lysimeter work? The PIs also need to clarify the sampling approach with regard to suspended sediment and bottom sediment, which is confusing in the present plan.

One reviewer felt the need for a pilot study prior to fully supporting the project. There is reason to agree with the supposition of the applicants that the Yolo Bypass contains environments that would support mercury methylation when inundated. The pilot stage could yield at least some information about the flux of methylmercury through the Yolo Bypass. This would be a very small effort with a considerable return on investment.

3. **Outcomes and Products.** Will the project advance the state of scientific knowledge in general and/or make an important contribution to the state of knowledge of the Bay-Delta Watershed? For restoration proposals, is the project likely to contribute to ecosystem restoration or species recoveries in a significant way? Will the project produce products useful to decision-makers and scientists?

There is no doubt that a properly-designed study would be applicable to management concerns. The mass balance approach is valuable and certainly applicable to other potential management sites in the Bay-Delta region. The PIs certainly have the proven track record and could conduct a properly-designed study successfully. Alpers and DiPasquale have published in the recent Hg literature and their knowledge and research capabilities fill out a strong project. They may want to divert some of the funding to an individual with more experience in photodegradation processes. A better sense of a final product for management is warranted.

4. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

The budget is lacking in detail. For example, over the 3 years of the project, nearly \$300,000 is attributed to "collective laboratory costs for various chemical analyses..." and needs clarification. The tasks attributed to the hours of the applicants and technicians for whom salary is requested are unspecified in the budget justification. The costs are high and the PIs could have partnered with an academic institution to bring young graduate students and postdocs into the project at the expense of some of the direct salary costs of the project. Students could certainly help in the laboratory and allow for flexibility of answering interesting research sidelights.

5. **Regional Review.** How did the regional panel(s) rank the proposal (High, Medium, Low)? Did the regional panel(s) identify significant benefits (regional priorities, linkages with other activities, local involvement) or impediments (local constraints, conflicts with other activities, lack of local involvement) to this proposal? What were they?

**Sacramento Regional Review - Medium** The proposal addresses a very important issue, but did not receive "High" rating because of some concerns about feasibility and sampling design. Better coordination is needed with restoration efforts and local stakeholders in the region. The authors have correctly identified a critical issue for Yolo Bypass restoration and appear to be

well qualified to do the field and laboratory work. However, the Review Panel had a number of substantial concerns about the study design.

The Review Panel was concerned that USGS study did not focus on Knight's Landing Ridge Cut, one of the primary likely mercury inputs to the floodplain. This input is perhaps the major contributor of sediments to Yolo Bypass, yet was not discussed in the problem statement or included in the experimental design. It is unclear how the authors can accurately assess the sources and amounts of loading without including KRC. They suggest deleting one of the Yolo Bypass transects and adding a site at KRC.

The authors identify diversity in land use (e.g. rice vs. seasonal wetlands) as being potentially major issues in the dynamics of mercury in the Bypass. However, this issue was not addressed in the study design, which remains a fairly broad scale study. A comparison of how different land uses contribute to total mercury loading would be especially valuable to CALFED for the planning of restoration projects in Yolo Bypass.

The Review Panel also questioned whether the experimental design is adequate to assess the lateral variability in the Bypass. Studies by DWR have revealed that Yolo Bypass tributaries has "bands" that shift position depending on flow. It is unclear how the proposed transects will be integrated to estimate loading. It may be necessary to use a hydrodynamic model or field measurements to describe the inputs from each bank.

The USGS gage at Woodland is not rated below 1000 cfs. Therefore, we do not have a good measurement of total Yolo Bypass flow during drier periods. How will the authors address loading at low flows, when agriculture and wildlife area land use could be especially important? Note: Some data may be available during 2002, when DWR Central District will be installing acoustic doppler instrumentation at Lisbon Weir; however, it is unclear if this instrumentation will still be installed when USGS proposes to do their work.

6. **Administrative Review.** Were there significant concerns about the proposal with regard to the prior performance, environmental compliance and budget administrative reviews? What were they?

No permits needed for project, however, since this a federal agency project; applicant needs to verify that NEPA compliance is not required.

Miscellaneous comments:

None

## Delta Regional Review:

**Proposal Number:** 240

**Proposal Title:** Mercury and Methylmercury Loads to the Yolo Bypass and Delta / Transformations of Mercury and Methylmercury Within the Yolo Bypass

Overall Ranking:   -Low   **XMedium**   -High

Provide a brief summary explanation of the committee's ranking:

**Committee did not see the immediate need for this project. Project not as clearly laid out as PIs' other proposal and some of the tasks overlap with other proposal, which we did highly recommended.**

1. Is the project feasible based on local constraints?

**XYes** -No

How?

**PIs have experience sampling both dry and wet weather discharge in these waterways. Sites have been scoped out and have been previously used for this kind of sampling. Discharge patterns (wet and dry) to the Yolo Basin appear to be well understood.**

2. Does the project pursue the restoration priorities applicable to the region as outlined in the PSP?

**XYes** -No

How?

**Understanding the loading of Hg and MeHg to the Delta is a PSP priority. Assessing the capability of the Yolo Bypass to produce MeHg and the mechanisms important to MeHg production is important in management and has implications for considering potential wetland construction.**

3. Is the project adequately linked with other restoration activities in the region, such as ongoing implementation projects and regional planning efforts?

**XYes** -No

How?

**PIs are associated with other Hg-related projects in the area. This work focuses on an identified information gap regarding a known large source of Hg to the Delta (Yolo bypass). They are also associated with other proposed projects.**

**Not clearly associated with current Transport, Cycling, and Fate of Hg proposal that seems to overlap some of this projects more focused work.**

4. Does the project adequately involve local people and institutions?

☒ Yes -No

How?

**Two PIs are from the local USGS office (Sacramento). Otherwise, though, there is no mention made of local group involvement (e.g. Delta Tributaries Mercury Council).**

Other Comments:

**None.**

## Sacramento Regional Review:

**Proposal Number:** 240

**Applicant Organization:** US Geological Survey

**Proposal Title:** Mercury and Methylmercury Loads to the Yolo Bypass and Delta / Transformations of Mercury and Methylmercury Within the Yolo Bypass

Overall Ranking:    -Low    **XMedium**    -High

Provide a brief summary explanation of the committee's ranking:

**The proposal addresses a very important issue, but did not receive "High" rating because of some concerns about feasibility and sampling design. Better coordination is needed with restoration efforts and local stakeholders in the region.**

1. Is the project feasible based on local constraints?

**XYes** -No

How?

**Yes, the investigators appear to have the necessary permits to accomplish this study. They also believe they can access the appropriate sites. However, hydrology represents an important potential constraint. The study design depends largely on the presence of at least one flood event during the sampling period. Yolo Bypass does not flood every year and it is unclear whether the study will be valuable if both years are dry. The authors should develop a contingency plan for years with different hydrology.**

2. Does the project pursue the restoration priorities applicable to the region as outlined in the PSP?

**XYes** -No

How?

**Mercury loading is one of the single most important issues in Yolo Bypass, one of CALFED's priority areas for restoration. This study addresses a critical information gap.**

3. Is the project adequately linked with other restoration activities in the region, such as ongoing implementation projects and regional planning efforts?

-Yes **XNo**

How?

**There appears to be good coordination between this study and several mercury research studies (e.g. UCD). There is no indication that the authors have coordinated with another USGS researcher (Larry Schemel, Menlo Park), who has collected water quality information for the Yolo Bypass. Like many other research projects submitted to the Review Team, there**

**does not appear to be any coordination with groups working on restoration projects in the region including DFG, Yolo Basin Foundation, DWR and USFWS. If funded, the authors should commit to better communication with these groups.**

4. Does the project adequately involve local people and institutions?

-Yes XNo

How?

**As noted above, the authors appear to have a strong collaborative relationship with other groups doing mercury research in the area. However, they have apparently not contacted any of the stakeholders in this area. The Review Panel suggests that the authors get in touch with the Yolo Basin Working Group, a stakeholder forum for Yolo Bypass. Yolo Basin Foundation is the lead for this effort.**

Other Comments:

**The authors have correctly identified a critical issue for Yolo Bypass restoration and appear to be well qualified to do the field and laboratory work. However, the Review Panel had a number of substantial concerns about the study design.**

**The Review Panel was concerned that USGS study did not focus on Knight's Landing Ridge Cut, one of the primary likely mercury inputs to the floodplain. This input is perhaps the major contributor of sediments to Yolo Bypass, yet was not discussed in the problem statement or included in the experimental design. It is unclear how the authors can accurately assess the sources and amounts of loading without including KRC. We suggest deleting one of the Yolo Bypass transects and adding a site at KRC.**

**The authors identify diversity in land use (e.g. rice vs. seasonal wetlands) as being potentially major issues in the dynamics of mercury in the Bypass. However, this issue was not addressed in the study design, which remains a fairly broad scale study. A comparison of how different land uses contribute to total mercury loading would be especially valuable to CALFED for the planning of restoration projects in Yolo Bypass.**

**The Review Panel also questioned whether the experimental design is adequate to assess the lateral variability in the Bypass. Studies by DWR have revealed that Yolo Bypass tributaries for "bands" that shift position depending on flow. It is unclear how the proposed transects will be integrated to estimate loading. It may be necessary to use a hydrodynamic model or field measurements to describe the inputs from each bank.**

**The USGS gage at Woodland is not rated below 1000 cfs. Therefore, we do not have a good measurement of total Yolo Bypass flow during drier periods. How will the authors address loading at low flows, when agriculture and wildlife area land use could be especially important? Note: Some data may be available during 2002, when DWR Central District will be installing acoustic doppler instrumentation at Lisbon Weir; however, it is unclear if this instrumentation will still be installed when USGS proposes to do their work.**

**A couple minor comments: 1) the capacity of Yolo Bypass is about 500,000 cfs, not 250,000 cfs. 2) Yolo Basin Wildlife Area is not the only wetlands; there is another major 2,500 acre refuge (Swanston) and numerous duck clubs.**

# External Scientific: #1

## Research and Restoration External Scientific Review Form

Proposal Number: **240**

Applicant Organization: **US Geological Survey**

Proposal Title: **Mercury and Methylmercury Loads to the Yolo Bypass and Delta / Transformations of Mercury and Methylmercury Within the Yolo Bypass**

### Conflict of Interest Statements:

I have no financial interest in this proposal.

**X**Correct

-Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

**None.**

### Review:

**Please provide an overall evaluation summary rating:**

**Excellent: outstanding in all respects;**

**Good: quality but some deficiencies;**

**Poor: serious deficiencies.**

| Overall Evaluation Summary Rating | Provide a brief explanation of your summary rating  |
|-----------------------------------|---|
| -Excellent                        | <b>The lack of preliminary data and a vague budget prevent me from supporting this proposal.</b><br><br><b>The most preliminary evidence to support the hypotheses, an experimental component, and a well constructed, explicit budget would change this rating to excellent.</b> |
| -Good                             |   |
| XPoor                             |   |

1. **Goals.** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

**The driving hypothesis of this research project is that seasonal flooding of the Yolo Bypass leads to episodic spikes in methylmercury formation ultimately to the downstream loading of methylmercury to the Sacramento-San Joaquin Delta. The applicants indicate that the Yolo Bypass is known to be important in the transport of inorganic mercury, but the production and degradation of methylmercury in this system has not been determined. Given the environmental parameters that are known to govern the production of methylmercury, the objective is consistent with the scientific literature, and poses an interesting and timely question. I find the questions related to the impact of agricultural practices in the Yolo**

**Bypass during the non-flood season on mercury dynamics to be particularly interesting.**

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

**The science upon which the driving hypothesis is constructed is sound. There is reason to agree with the supposition of the applicants that the Yolo Bypass contains environments that would support mercury methylation when inundated.**

**However, the applicants state that the role of the Yolo Bypass in "production and degradation of methylmercury has yet to be determined". I feel that this project requires a pilot stage where at the very least some information about the flux of methylmercury through the Yolo Bypass is acquired. This would be a very small effort with a considerable return on investment. The proposal would be strengthened considerably to be able to state definitively that methylmercury concentrations are elevated in the waters of the Yolo Bypass during inundation. Many of the hypotheses regarding the role of agricultural practices could be tested in a preliminary fashion using a laboratory or mesocosm approach at considerably less expense. This type of preliminary work could easily justify the research proposed here, however no data to this effect are presented.**

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

**The approach is appropriate and well designed for the project as proposed, however as stated in 2. (above), I feel that the undertaking of a pilot/experimental component before the proposed whole-system study would be highly appropriate. The project has the potential to generate novel information that would be useful to decision-makers. For example, the demonstration that seasonally-inundated bypasses or other floodplains produce appreciable amounts of methylmercury, and that agricultural practices deleteriously impact downstream ecosystem quality through the enhancement of mercury methylation is important information.**

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

**The sampling and analytical approaches outlined in the proposal are well documented and technically feasible. The likelihood of success in demonstrating the Yolo Bypass as a source of methylmercury to the downstream system is uncertain. The scale of the project is very large. As in 2. (above), I feel that a smaller scale pilot effort would go a long way towards demonstrating some of the important ideas expressed in this proposal.**

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

**The performance measures are vague, with the exception of peer-review publication. I do not consider "completeness of measurements according to the time frame established" a measure of performance that need even be stated.**

Similarly, I am surprised by the statement that "no sampling or analyses will take place until an updated quality control plan (QAP) is finalized and reviewed by a recognized expert in the field of mercury and methylmercury analysis." I am of the opinion that Dr. Marvin-Dipasquale is such a recognized expert and is a participant in this project. I find this apparent contradiction puzzling and concerning.

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

The dissemination of findings from this project to the scientific community through reports, peer-reviewed publication and presentations are indicated are the primary products of this project. I find the prediction of "at least two" research articles from this research to be poor return on an investment of over \$1.3 million.

7. **Capabilities.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

The applicants are all highly qualified scientists in their respective fields. the infrastructure for some of the research (microbiological) is available at Dr. Marvin-Dipasquales facility at Menlo Park. It is unclear whether the project intends to contract to Frontier Geosciences for mercury analyses or simply utilize the "method of Frontier Geosciences" (p.6). As this is central to the project, it would be appropriate to have clarification on how the samples are to be analyzed.

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

I find the budget profoundly lacking in detail. For example, over the 3 years of the project, nearly \$300,000 are attributed to "collective laboratory costs for various chemical analyses...". This is sufficiently vague as to be useless for the purposes of review. The tasks attributed to the hours of the applicants and technicians for which salary is requested are completely unspecified in the budget justification.

The lack of information makes it impossible for me to judge whether or not the budget is reasonable or adequate.

#### **Miscellaneous comments:**

I am surprised by this proposal. Upon reading the ideas presented in the introduction, I was intrigued by the potential for novel results through experimental science. I was disappointed to find that the proposal was for what largely amounted to a monitoring effort.

## External Scientific: #2

### Research and Restoration External Scientific Review Form

Proposal Number: **240**

Applicant Organization: **US Geological Survey**

Proposal Title: **Mercury and Methylmercury Loads to the Yolo Bypass and Delta / Transformations of Mercury and Methylmercury Within the Yolo Bypass**

#### Conflict of Interest Statements:

I have no financial interest in this proposal.

**X**Correct

-Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

**I have worked with MMdP in the Everglades. I do not feel that this compromises the integrity of this review.**

#### Review:

**Please provide an overall evaluation summary rating:**

**Excellent: outstanding in all respects;**

**Good: quality but some deficiencies;**

**Poor: serious deficiencies.**

| Overall Evaluation Summary Rating | Provide a brief explanation of your summary rating   |
|-----------------------------------|--|
| <b>X</b> Excellent                | <b>Since there is not a category of very good, I would have to rate this proposal as excellent, since it outshines others that I have ranked as good. The study site is excellent and affords a well-defined mass balance approach. The PIs should consider partnering with a university, especially with regard to photochemical studies and abilities for flexibility in research.</b> |
| -Good                             |  |
| -Poor                             |  |

1. **Goals.** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

**The PIs propose to conduct a study of mercury cycling in a relatively confined area of the Sacramento River Basin, the Yolo Bypass. They set up the reasons for studying the area and associated Hg problems, yet they really do not present a concise listing of the major goals, subgoals and hypotheses. The proposal certainly would have been an easier read with such a format, especially stated hypotheses.**

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

**This is an interesting study design and one that would result in a rather confined mass balance for a system that receives temporary flooding and would allow a field experiment on reservoir effects on Hg cycling. This is a topic that is high on the radar screens of Hg researchers and one that is of great interest as management concerns contemplate options for wetland creation. This is both a research and monitoring project that combines new techniques for understanding Hg formation and degradation and utilizes the strengths of hydrologists to conduct the true balance.**

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

**A tight study on the Hg dynamics of the Yolo Bypass appears to be a nice opportunity for a project that is mass-balance driven and one that even from a simple input-output study would prove quite valuable. The addition of understanding processes within the flooded area is a bonus and one that gives the study even more credibility.**

**It is imperative that the PIs fully explore the loading from any potential input source along the course of the Yolo Bypass. This will require intensive sampling during the input season and it is also important to measure every last drop out of the system. First, the PIs need to make sure that they capture the magnitude of the flux at the very onset of flooding of the area. There is potential that displacement subsurface water and the associated MeHg built up over the agricultural growing season may be the greatest flux. It is therefore quite important for the methylation studies to occur for during what would be perceived as the dry season, yet a time for either formation in or leaching to, groundwater. Perhaps some piezometer/lysimeter work?**

**The proposal is quite short on analytical details that must be evaluated in the project. What is the design of the photochemical degradation work? Will this be subcontracted? Which laboratory will be conducting the low level Hg and MeHg analyses?**

**This project, like many others, does not address any atmospheric inputs to the system. While this may not be important during high flow, selected storms may be important during the drier periods in displacing subsurface waters and delivering new Hg to the system. Have the PIs considered those effects?**

**I am somewhat perplexed by the use of the Frontier Geosciences method for Hg speciation. Isn't this the Tessier method and should it not be acknowledged as such? If so what will each of the fractions mean with respect to methylation and leaching? It would appear that the true chemistry of this approach is weak at best. Don't we really need more direct measures of binding constants for both solid and aqueous phases? I think that this approach of the Frontier method will lead down the same path as trying to define reactive Hg.**

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

**This project has a high probability of success, especially from a mass balance type of study. The scale of the project is consistent with the objectives, at least for the first two years.**

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

**As with many of these proposals, I have trouble with the concept of performance measures being a simple discussion of QA and occasional outside review. Neither of those measures directly relate to the success of specific milestones or benchmarks of specific goals. Shouldnt the preliminary mass balance with a measure of variance be the first step? This can be used to direct resources in Year 2, etc.**

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

**There is no doubt that the results of this study will be both high quality and directly applicable to management concerns. That is, if the PIs fully document their analytical techniques and the proper QA associated with them. The mass balance approach is valuable and certainly applicable to other potential management sites in the Bay-Delta region.**

7. **Capabilities.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

**The PIs certainly have the proven track record to pull off this project successfully. Alpers and DiPasquale have published in the recent Hg literature and their knowledge and research capabilities fill out a strong project. They may want to divert some of the funding to an individual with more experience in photodegradation processes. I am certain high quality publications will result from this work.**

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

**I must admit that the costs for this project is high and I wish that they had partnered with an academic institution to bring young graduate students and postdocs into the project at the expense of some of the direct salary costs of the project. Students could certainly help in the laboratory and allow for flexibility of answering interesting research sidelights. I also am quite shocked to see a full year of this project dedicated to publications at \$181K. Most of us who write research papers do it at night and weekends and would love to have this type of sabbatical time paid!**

**Miscellaneous comments:**

## External Scientific: #3

### Research and Restoration External Scientific Review Form

Proposal Number: **240**

Applicant Organization: **US Geological Survey**

Proposal Title: **Mercury and Methylmercury Loads to the Yolo Bypass and Delta / Transformations of Mercury and Methylmercury Within the Yolo Bypass**

#### Conflict of Interest Statements:

I have no financial interest in this proposal.

**X**Correct

-Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

**none**

#### Review:

**Please provide an overall evaluation summary rating:**

**Excellent: outstanding in all respects;**

**Good: quality but some deficiencies;**

**Poor: serious deficiencies.**

| Overall Evaluation Summary Rating | Provide a brief explanation of your summary rating  |
|-----------------------------------|---|
| <b>X</b> Excellent                | <b>I think the authors of this proposal have clearly identified a major potential source of MMHg to the Delta. The combination of field studies and laboratory studies makes this a very strong proposal. The results from this study will be applicable to other studies. In particular the microbiology studies will be of great value mercury research in general.</b> |
| -Good                             |   |
| -Poor                             |   |

1. **Goals.** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

**The main goal of this proposal is to determine loads of mercury and in particular, methylmercury (MMHg), that flow out of the Yolo Bypass. The authors have presented plausible hypotheses supported by recent research suggesting that hydrologic and chemical conditions in the Bypass may be ideal for methylating mercury during certain times of the year. The goal and objectives carry through the proposal consistently.**

**This proposal presents important work that will increase the understanding of MMHg production in the Yolo Bypass. The experimental aspect of the work will also make it applicable to other study areas where some of the same questions are asked. Thus, the**

concept is very timely and important.

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

**This is a strong point for the proposal. Current research suggests that sulfur dynamics play a key, but poorly understood role, in MMHg cycling. Recently flooded areas have been shown to produce large loads of MMHg shortly after flooding. The MMHg production in permanently flooded areas decreases over time, but it is unclear what happens in seasonally flooded areas such as the Yolo Bypass. The combination of field and experimental studies proposed in this work has the potential to be applicable in other similar situations (e.g. reservoirs that experience daily or other short term changes in water level)**

**The conceptual model presented in this paper is well-founded. Rice paddies may be important sources of MMHg in the summer, while flooding of the Bypass in the winter coupled with sulfur loads from agricultural activities may also enhance MMHg formation.**

**This project is a research project and the nature of the question strongly supports this type of work.**

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

**The approach is basically well-designed and should meet the objectives of the project. Loads are always difficult to quantify in this type of system, but I feel the sampling plan is adequate. The microbial work I feel is the real strength of the proposal. Mass budgets are difficult and costly to accomplish in this type of system, but the microbial work should indicate whether more intensive mass balance efforts are required. The methylation/demethylation studies coupled with the MMHg photodemethylation I feel are the most intriguing aspects of the proposal. High rates of MMHg production in the sediments coupled with high photodemethylation rates in the water column may indicate that loading to the Delta is minimal.**

**I don't feel the HgII photoreduction experiments are all that critical to this work. Even if Hg(O) production rates are appreciable, the authors will have to model air-water exchange rates (and possibly reoxidation rates) to demonstrate the impact on the overall Hg mass balance. The comparison of total mercury that is ultimately lost via reduction and volatilization relative to total mercury lost via sedimentation and then methylated would be interesting, but difficult to accomplish in this system. I think the authors should focus on the MMHg photodemethylation rates in the water column and methylation rates in the sediments.**

**The approaches in this proposal, while not novel, are cutting-edge approaches and very appropriate. The results from this work will add to our understanding of MMHg production in general; and transport in of MMHg from semi-permanently flooded areas. The data from this research project will also aid decision makers in their management of the Yolo Bypass.**

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

**The approach is well-documented and entirely technically feasible. This project has a high likelihood of success. I think the authors have done a nice job of scaling the project to realistic objectives.**

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

**Yes, it will be clear whether spikes in methylation occur in the Yolo Bypass. The authors have completed high quality work before and the QAP for this project has been established in previous projects.**

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

**The products from this research will be of high value. The load of MMHg from the Yolo Bypass will be better understood. Conditions in the Bypass leading to higher MMHg production will also be more clear.**

7. **Capabilities.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

**I have a lot of respect for Dr. Marvin-DiPasquale's work. I think his published work on MMHg degradation pathways was outstanding and that he is highly qualified to conduct this research. Dr. Domagalski and Dr. Alpers are also both highly qualified. The project's choice for an analytical laboratory, Frontier Geosciences, is highly regarded as a mercury laboratory. It was unclear what labs would do the radioisotope analysis and stable Hg isotope analysis, but there are USGS labs capable of these analyses. Clearly, the USGS has the infrastructure to conduct this research.**

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

**The analysis of MMHg, stable isotopes of Hg, and Hg speciation are all quite expensive analyses. I think the budget is appropriate and adequate.**

**Miscellaneous comments:**

**none**

## External Scientific: #4

### Research and Restoration External Scientific Review Form

Proposal Number: **240**

Applicant Organization: **US Geological Survey**

Proposal Title: **Mercury and Methylmercury Loads to the Yolo Bypass and Delta / Transformations of Mercury and Methylmercury Within the Yolo Bypass**

#### Conflict of Interest Statements:

I have no financial interest in this proposal.

**X**Correct

-Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

**The authors also work for the USGS. I have never met the authors, nor do we work in the same division.**

#### Review:

**Please provide an overall evaluation summary rating:**

**Excellent: outstanding in all respects;**

**Good: quality but some deficiencies;**

**Poor: serious deficiencies.**

| Overall Evaluation Summary Rating | Provide a brief explanation of your summary rating  |
|-----------------------------------|---|
| -Excellent                        | <b>The authors propose several ideas that are worth pursuing, but I recommend that they submit a pilot study rather than the full \$1.3 million study because of several unanswered questions in the proposal. More detail on sediment sampling is needed, as well as an analysis of flows necessary for mercury mobilization, and a contingency plan if the flows necessary for monitoring do not occur.</b> |
| XGood                             |   |
| -Poor                             |   |

1. **Goals.** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

**The goals of this proposal are timely. Bioaccumulation from methylmercury is a real problem, and although much mercury enters the Yolo Bypass, the flux of mercury and its dynamics are not well known.**

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

**The justification for the proposal seems to be for a monitoring project that will determine the extent of the mercury problem in the Yolo Bypass. A \$1.3 million project to see if mercury methylation "may present a risk for aquatic organisms" in the Yolo Bypass is too much for a full blown project. First, a scaled down version of this project to assess the importance of mercury methylation in the Yolo Bypass as a pilot study is needed.**

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

**In a broad sense the approach is reasonable, but more specific information is needed. Task 1: collect a sufficient number of water samples What is 'sufficient'? If we had a pilot study, we would have a basis for the sampling program.**

**Task 2: Sediment dynamics and channel characteristics need to be addressed in more detail. "The chemistry of bed sediment and soil at select locations will be analyzed" "Sediment sampling will be completed at three locations within the Yolo Bypass.." The depth of mobility of the sediments during high flow needs to be determined so that an appropriate depth of soil sample can be collected. The Yolo Bypass is very wide - where is sediment most likely to be mobilized and how will the sampling scheme be constructed? Where will sediment be collected from, and based on what type of sampling protocol? Does mercury accumulation depend on the particle size of the sediment deposit, and are the stratigraphy and fabric of the deposits part of the sampling scheme? Will samples be integrated or analyzed separately? Will bed samples be collected before the Bypass is inundated?**

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

**The feasibility of the project is high, and the researchers have experience in sampling water for mercury analysis. The authors state that access to the sample sites is not a problem, and there is already an established laboratory to process the samples.**

**Water quality measurements are dependent on flow. The authors assume that Bypass flow will start in November, and that samples can be taken throughout the high flow season. What happens if it's a low flow year with little water volume through the Bypass, or an extremely high flow year? The sample size of 8 (p. 5, approach) is already small.**

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

**The authors propose very good performance standards. A Quality Control Plan will be finalized and reviewed before sampling and analysis will take place. The USGS is known for careful quality control. In addition, results will be peer reviewed.**

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

**Yearly progress reports, presentations at scientific meetings and journal articles are the expected products. I would like to see more accessible technology transfer to the affected parties. Page 14 describes public outreach and local involvement, but besides attending meetings authors should prepare some type of brochure or news brief for the laymen.**

7. **Capabilities.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

**Based on the biographies and list of citations, the authors seem very qualified to conduct this research.**

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

**The costs are high. It seems that CalFed would be paying the salaries of permanent federal employees? Over \$800,000 would be used for sample collection, and yet I had several questions about sampling protocol. More detail would be needed to assess the adequacy of the budget task by task.**

**Miscellaneous comments:**

## **Prior Performance/Next Phase Funding:**

**New Proposal Number:** 240

**New Proposal Title:** Mercury and Methylmercury Loads to the Yolo Bypass and Delta / Transformations of Mercury and Methylmercury Within the Yolo Bypass

1. Prior CALFED project numbers, titles, and programs: *(list only projects for which you are the contract manager)*

**1. Prior CALFED project numbers, titles, and programs (list only projects for which you are the contract manager)**

**CALFED #99-B06, USBR #99-FC-20-0241 - San Jose State University Foundation - Assessment of Ecological and Human Health Impacts of Mercury in the Bay-Delta Watershed**

**CALFED #97-B02, USBR #98-AA-20-16230 - U.S. Geological Survey - Sedimentation Movement, Availability and Monitoring in the Delta - David Schoellhamer**

**CALFED #97-B06, USBR #98-AA-20-16240 - U.S. Geological Survey - Assessment of the Sacramento-San Joaquin River Delta as Habitat for Production of the Food Resources that Support Fish Recruitment - William Sobczak**

**CALFED #98-B07, USBR #98-AA-20-16950 - U.S. Geological Survey - Assessment of the Impacts of Selenium on Restoration of the San Francisco Bay-Delta Ecosystem - Sam Luoma**

2. Prior CVPIA project numbers, titles, and programs: *(list only projects for which you are the contract manager)*

**N/A**

3. Have negotiations about contracts or contract amendments with this applicant proceeded smoothly, without persistent difficulties related to standard contract terms and conditions?

**X**Yes -No -N/A

If no, please explain any difficulties:

4. Are the status, progress, and accomplishments of the applicant's current CALFED or CVPIA project(s) accurately stated?

-Yes -No **X**N/A

If no, please explain any inaccuracies:

5. Is the applicant's progress towards these project(s)' milestones and outcomes to date satisfactory?

-Yes -No **X**N/A

If no, please explain deficiencies:

6. Is the applicant's reporting, records keeping, and financial management of these projects satisfactory?

-Yes -No **X**N/A

If no, please explain deficiencies:

7. Will the project(s) be ready for next phase funding in 2002, based on its current progress and expenditure rates?

-Yes -No **X**N/A

If no, please explain:

Other Comments:

**In relation to 99-B06, USGS is one of the subcontractors to the agreement with the San Jose State University Foundation, so I have no direct knowledge of USGSs performance on that project.**

**USGS agreements are invoiced directly through a central billing system and do not require my personal approval as an interagency agreement, therefore it is a little harder to track aside from deliverables and quarterly reports received. All three USGS agreements are complete, with a final report due from 98-B07, agreement ending December 31, 2001. No problems encountered in my dealings with the three project managers for 97-B02, 97-B06, or 98-B07.**

## **Environmental Compliance:**

**Proposal Number:** 240

**Applicant Organization:** US Geological Survey

**Proposal Title:** Mercury and Methylmercury Loads to the Yolo Bypass and Delta / Transformations of Mercury and Methylmercury Within the Yolo Bypass

1. Are the legal or regulatory issues that affect the proposal identified adequately in the proposal?

☒Yes ☐No

If no, please explain:

**No permits needed for project, however, since this a federal agency project, applicant needs to verify that NEPA compliance is not required.**

2. Does the project's timeline and budget reflect adequate planning to address legal and regulatory issues that affect the proposal?

☒Yes ☐No

If no, please explain:

3. Do the legal and regulatory issues that affect the proposal significantly impair the project's feasibility?

☐Yes ☒No

If yes, please explain:

Other Comments:

## **Budget:**

**Proposal Number:** 240

**Applicant Organization:** US Geological Survey

**Proposal Title:** Mercury and Methylmercury Loads to the Yolo Bypass and Delta / Transformations of Mercury and Methylmercury Within the Yolo Bypass

1. Does the proposal include a detailed budget for each year of requested support?

☒Yes ☐No

If no, please explain:

2. Does the proposal include a detailed budget for each task identified?

☒Yes ☐No

If no, please explain:

3. Does the proposal clearly state the type of expenses encompassed in indirect rates or overhead costs?

☒Yes ☐No

If no, please explain:

4. Are appropriate project management costs clearly identified?

☒Yes ☐No

If no, please explain:

5. Do the total funds requested (Form I, Question 17A) equal the combined total annual costs in the budget summary?

☐Yes ☒No

If no, please explain (for example, are costs to be reimbursed by cost share funds included in the budget summary).

**No cost share indicated. Verify applicant's budget request to CALFED - \$1,340,652 v. 1,306,805.**

6. Does the budget justification adequately explain major expenses?

☒Yes ☐No

If no, please explain:

7. Are there other budget issues that warrant consideration?

-Yes ☒No

If yes, please explain:

Other Comments: